and phase-shifters) in series. Each microring in a weight-bank represents a weight, and weighting mechanism is performed by changing the resonance wavelength [7]. A n-doped heater embedded in the microring alongside the waveguide is used to change the temperature of the silicon to affect the refractive index (n_{eff}) of the silicon which leads to change the resonance wavelength ($_{res}$) according to the equation [6], [8]:

$$_{res} = \frac{n_{eff} L}{m} \tag{1}$$

where $L = 2 \ R$ is the length of the microring waveguide, and m is the order of resonant mode. The $_{res}$ is extracted experimentally by doing a current sweep. A 4th order polynomial fit is performed to find n_{eff} from Eq.1 and is implemented in the Verilog-A phase shifter model. Figure 2 shows the comparison between the experimental and simulated spectrum of the n-doped heater.

Fig. 2. Comparing the Verilog-A simulated and experimental spectrum of a n-doped microring resonator where the current to the heater is swept from 0-1 mA.

B. Mircoring Modulator

The p-n junction microring modulator is constructed by combining the coupler and p-n junction phase shifter [2]. The p-n phase shifter exploits plasma-dispersion and carrier depletion effects, and the parameters ($n_{eff}(V)$, $_{eff}(V)$) are extracted experimentally and implemented in Verilog-A model. Figure 3 shows the comparison between the simulated and experimental spectrum of microring modulator.

Fig. 3. Comparison of the simulated and experimental spectrum of microring modulator for different reverse bias voltages.

III. Photonic Neuron Simulation

A single photonic neuron is simulated in Verilog-A. Figure 4 shows the schematic of the single photonic